History of Medicine

Neurologic Aspects of Human Anomalies

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The history of medicine is replete with unique or unusual patients who, although the subjects of cruel quirks of nature, contributed greatly to the knowledge of disease. Most students of neurology are familiar with Dr Harlow's famous patient, Phineas P. Gage, who was changed from a temperate, industrious foreman to a sociopathic vagabond after an explosion sent a 3½ foot iron tamping rod through his left frontal lobe.[1] Harlow reported that after 12 years of capricious behavior and unstable employment, including a brief stint on exhibit with his "iron" at Barnum's American Museum, Gage died in status epilepticus.[2,3] The Gage case illustrated that although profound frontal lobe trauma might spare the intellect and motor system, personality would be affected. Many of the human oddities, or "prodigies" as they now prefer to be called, were required to earn their living by exhibiting themselves in sideshows. Harvey Cushing was fascinated by circus sideshows, especially the giants, midgets and fat ladies. He befriended these "prodigies," keeping in touch with them over the years, and utilized the midgets to test the effect of growth hormone.[4]

Some of the more famous human curiosities include Charlie Byrne (the Irish Giant), Charles Stratton (Tom Thumb), Isaac Sprague (the Skeleton Man), James Morris (the Elastic Skin Man), Eng and Chang Bunker (the Siamese Twins) and John Merrick (the Elephant Man). An examination of their histories provides some interesting facts about the neurologic aspects of their disorders, as well as adding color to medical history because they crossed paths with some of the greats of medicine. But, more important, many of their stories are inspiring and present a lesson in human courage and dignity in the face of overwhelming odds.

One of the most interesting of the human curiosities was Charlie Byrne of Ireland, born 1761. In 1782, after serving as a porter to George III at St James's Palace in London (giants and midgets were collected by royalty), he placed himself on exhibit as the tallest man in the world, claiming his height was 8 ft 4 in.[5] He came to the attention of John Hunter, the most gifted surgeon of 18th century England, who had a passionate curiosity about experimental science. Hunter conducted numerous experiments, including inoculating himself with pus obtained from a patient with gonorrhea so that he could observe first hand the progression of the disease.[6] He wished to add the Irish Giant to his personal museum which was to number more than 13,000 specimens. Byrne was so terrified that his body might be boiled down in the surgeon's kettle, however, that on his deathbed at the age of 22 he got a fisherman to agree to bury his body in the Irish Sea. (Death was attributed to alcoholism, although it probably was more directly related to acromegaly.) Hunter managed to acquire the body through a £500 bribe to the undertaker and the giant became the centerpiece of the Hunterian Museum. More than a century later, Harvey Cushing, fascinated by the pituitary, persuaded the curator of the Hunterian Museum to remove the Irish Giant's calvarium. As expected, the sella turcica was notably enlarged, and there was evidence of significant extrasellar extension.[4] Presumably, Byrne had a chromophobic or acidophilic adenoma of the pituitary. His 92¾-inch (7-ft 9-in) skeleton[7] (giants exaggerated their heights), as well as the kettle in which it was boiled, can still be seen at the Royal College of Surgeons in London (Figure 1).

Pituitary hypofunction is the cause of approximately 10% of the cases of dwarfism.[8] (Actually these persons are considered by laymen to be "midgets" rather than dwarfs since their body proportions are normal.) Such hypofunction may occasionally be associated with a craniopharyngioma or suprasellar cyst but more often reflects idiopathic multiple pituitary hormone deficiencies or isolated growth hormone deficiency. The latter may occur sporadically but usually is familial and transmitted as an autosomal recessive disorder. Charles Sherwood Stratton, the diminutive General Tom Thumb and the most famous dwarf in history, is probably an example of idiopathic pituitary hypofunction. He was discovered at age 5 by P. T. Barnum in 1842 at which time his height was 2 ft

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1 in and weight was 16 lb.[9] Thumb became a tremendous success, appearing before the royalty of Europe including Queen Victoria at Buckingham Palace, as well as President Polk at the White House. He earned millions, allowing him to indulge in his passion of thoroughbred horse racing and yachting. The wooing of his future midget-wife Lavinia, which resulted in fisticuffs with his equally diminutive rival, Commodore Nutt, was well publicized. Following their spectacular wedding at Grace Church, New York, which was attended by several thousand guests, the Thumbs were given a reception at the White House by President Lincoln.

As might be expected in pituitary dwarfism where the epiphyses of long bones remain open, Thumb continued to grow slowly far beyond the usual age of puberty, ultimately reaching a height of 3 ft 4 in. Also he had the typical puffy appearance of the skin with truncal obesity (eventually weighing a portly 70 lb) associated with hypopituitarism and probably reflecting a concomitant hypothyroidism. Although he and Lavinia failed to produce offspring (despite a hoax perpetrated by Barnum),[5] pictures of him before his death at age 45 showing a beard and mature male pattern of scalp hair indicate that he had attained some sexual development (Figure 2).

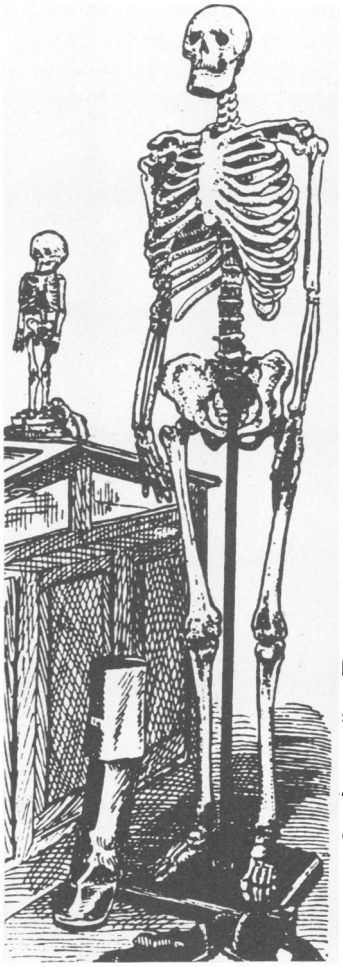

Figure 1.—Skeleton of the Irish Giant mounted alongside the skeleton of Caroline Crachami, the Sicilian Dwarf (19-in tall). (Taken from *Anomalies and Curiosities of Medicine* by George M. Gould, MD, and Walter L. Pyle, MD.[5] Copyright by W.B. Saunders and by The Julian Press, Inc. Used by permission of Crown Publishers, Inc.)

Certainly the bravest dwarf in history was Geoffrey Hudson who was presented in a pie to Henrietta Maria, Charles I's wife, in 1627 when he was 8 years old and about 1 ft tall.[5,0] His appearance in the painting by Van Dyke "Queen Henrietta Maria and Her Dwarf Geoffrey Hudson" (1635) suggests that he was a pituitary dwarf and strikingly handsome, lending credence to his boast of being able "to make married men cuckolds without making them jealous" (Figure 3). He served as a courier to the Stuarts and killed in a duel a gentleman named Crofts who had the misfortune to ridicule the dwarf's bravado. At age 30 Hudson was only 18 in tall but afterwards his height rapidly increased, ultimately to 45 in. He attributed this growth spurt to the indignities that he experienced while being held captive for ransom by Barbary Coast pirates. In actuality pituitary dwarfs often follow this postmaturity growth pattern. He died at the age of 63 after being imprisoned for taking part in a "papist plot."

Tom Thumb, Lavinia, Commodore Nutt and Geoffrey Hudson were all probably victims of pituitary dwarfism. On the other hand, the most common cause of disproportionate dwarfism is achondroplasia.[11] This is an autosomal dominant disorder (often sporadic) of endochondral bone formation resulting in skeletal deformities and neurologic abnormalities.[12] Because the base of the skull is the only portion preformed in cartilage, its growth is arrested whereas there is over-

Figure 2.—General Tom Thumb and Lavinia Warren. (Courtesy of Circus World Museum, Baraboo, Wisconsin.)

growth of the calvarium resulting in brachycephaly. In addition to macrocephaly, which is usually accompanied by mild ventricular dilatation without clinical evidence of increased intracranial pressure, there is occasionally significant hydrocephalus probably resulting from cerebrospinal fluid obstruction at the foramen magnum level. Vertebral abnormalities include exaggeration of the lumbar lordosis, unstable and recessed vertebral bodies and a stenotic spinal canal especially in the lumbar region. As a result, it is reported that in 40% of adult achondroplastic dwarfs dysfunction of the cauda equina develops.[11]

The muscular dystrophies have also produced human curiosities. Skeleton man Isaac Sprague, "The Original Thin Man," related that he was well until age 12 when he began to lose weight rapidly despite an excellent food intake. He exhibited himself at P. T. Barnum's New American Museum, New York City, in 1868 and was examined that year at the Boston Zoological Institute by Oliver Wendell Holmes.[9] Holmes is so well known for his literary works, such as *The Autocrat of the Breakfast Table,* that many do not realize that he was a prominent physician whose essay "On the Contagiousness of Puerperal Fever" (appearing five years before Semmelweis' work) is a medical classic.[13] Dr Holmes diagnosed Sprague to be suffering from "excessive progressive muscular atrophy." Actually Sprague, 5 ft 4 in tall and weighing only 52 lbs at age 48, was probably a victim of the autosomal recessive limb-girdle form of muscular dystrophy. The autosomal dominant facioscapulohumeral form is a less likely diagnosis because there was no family history and no facial involvement.

Other "skeleton men" may have suffered from infarction, tumor, trauma or infection of the adenohypophysis resulting in pituitary cachexia (Simmond's disease), anterior hypothalamic gliomas producing emaciation despite a ravenous appetite or motor neuron disease. Progeria, the Hutchinson-Gilford syndrome of premature senility, arteriosclerosis, dwarfism and wizened appearance,[14] may be another cause of this curious phenomenon. Cerebrovascular infarctions and angina may occur in the first decade, and the average age of death is 16 years as a result of coronary artery occlusion. A likely example was the little Welshman Hopkin Hopkins, exhibited in London as a natural curiosity in the 1750s. He died at the age of 17 "of mere old age and gradual decay" and never weighed more than 17 lb.[5]

Other historical living "skeletons" of uncertain pathogenesis included Claude Seurat, whose cardiac contractions were plainly visible because the distance from his sternum to his vertebral body was less than 3 in.[5] Exhibited in England in 1825, Seurat's daily food intake of a mere penny roll and a small quantity of wine stands in contrast to the excellent appetite of men like Sprague and James W. Coffey. The latter was known as the "Skeleton Dude" because of his outlandish costumes and weight of 70 lb (Figure 4 and 5).[9]

At the opposite end of this spectrum of deformity are the circus strong men, some of whom suffer from a

Figure 3.—*Queen Henrietta Maria and Her Dwarf Geoffrey Hudson* by Van Dyke (1635). (Courtesy of National Gallery of Art, Washington, DC; Samuel H. Kress Collection.)

Figure 4.—J. W. Coffey, Living Skeleton. (Courtesy of Hertzberg Circus Collection, San Antonio Public Library, San Antonio, Texas.)

Figure 5.—J. W. Coffey, Living Skeleton. (Taken from *Anomalies and Curiosities of Medicine* by George M. Gould, MD, and Walter L. Pyle, MD.[5] Copyright by W.B. Saunders and by The Julian Press, Inc. Used by permission of Crown Publishers, Inc.)

disorder classified with the muscular dystrophies, namely the autosomal recessive form of myotonia congenita (Thomsen's disease).[15] This relatively benign condition is characterized by tonic painless spasms of voluntary muscle and hypertrophy that can reach Herculean proportions. Unfortunately, strength is not proportional to muscle bulk, perhaps as a result of the associated mild distal weakness and the difficulty in relaxing antagonists.

Other favorites of circuses are "elastic skin men," otherwise known as "India rubber men" (Figure 6). James Morris was one example. A barber before he began earning $150 per week with the Barnum and Bailey Circus in the 1880s, he was able to pull the skin of his chest to the top of his head as a result of its hyperelasticity.[9] Of the heritable connective tissue disorders, this autosomal dominant Ehlers-Danlos syndrome is the oldest reported, being first described in 1682.[16] Clinical manifestations besides hyperelasticity include skin and blood vessel fragility in which slight injury may produce gaping wounds, hemorrhagic tendencies and easy bruisability, hyperextensible joints conducive to feats of contortionists as well as to habitual dislocations and dissecting aneurysm of the aorta. In addition, weakness of the media of intracranial arteries leads to aneurysms in the subarachnoid space.

No human oddity attracted more attention from the medical profession than the Siamese Twins, Eng and Chang Bunker. Upon arrival from Thailand in 1829, they were examined by John Collins Warren, professor of surgery at Harvard Medical School, later credited with being the first physician to use ether in a surgical procedure.[17] He advised against surgical separation because the interconnecting ligament, 4 in long and 8 in around, might contain a common peritoneal cavity. Evidence to suggest this was the observation that coughing or the Valsalva maneuver caused protrusion of abdominal viscera into the ligament. Warren noted that Chang was more dominant and irritable in temperament, whereas Eng was passive and mild mannered. Chang, who stood to the left and with his arm over Eng, had severe scoliosis (Figure 7).

After exhibiting themselves for a decade in Europe and the United States, the twins settled in Mount Aire, North Carolina, becoming prosperous, slave-owning farmers and scandalizing the community by marrying a local clergyman's two daughters. This harmonious union produced a total of 21 offspring—11 presumably by Eng and 10 presumably by Chang. Each family had its own house at which the twins spent alternating three-day periods. Mark Twain, a contemporary known for his interest in the bizarre, satirized the Siamese Twins,[18] writing that "During the war they were strong partisans, and both fought gallantly all through the great struggle—Eng on the Union side and Chang on the Confederate. They took each other prisoners at Seven Oaks. . . ." Concerning the courting of the clergyman's daughters, Twain wrote,

> Both fell in love with the same girl. Each tried to steal clandestine interviews with her, but at the critical moment, the other would always turn up. By and by, Eng saw, with distraction, that Chang had won the girl's affection; and, from that day forth, he had to bear with the agony of being witness to all their dainty billing and cooing.

As the twins aged, they became apprehensive of the fact that at the death of one, the other would be attached to a cadaver. This led to further consultations with leading medical authorities including Sir James Young Simpson, professor of medicine at Edinburgh, who introduced the use of chloroform in obstetrics; Rudolf Virchow, founder of cellular pathology, and Sir William Ferguson[19] of the Royal College of Surgeons. However, medical opinion remained unanimously against surgical separation as long as both were alive. A few years later, at the age of 59, while playing chess, Chang had a stroke resulting in a right hemiparesis. An interesting walking prosthesis was devised by their attending physician consisting of a crutch placed under Chang's paretic right arm and a leather strap that sup-

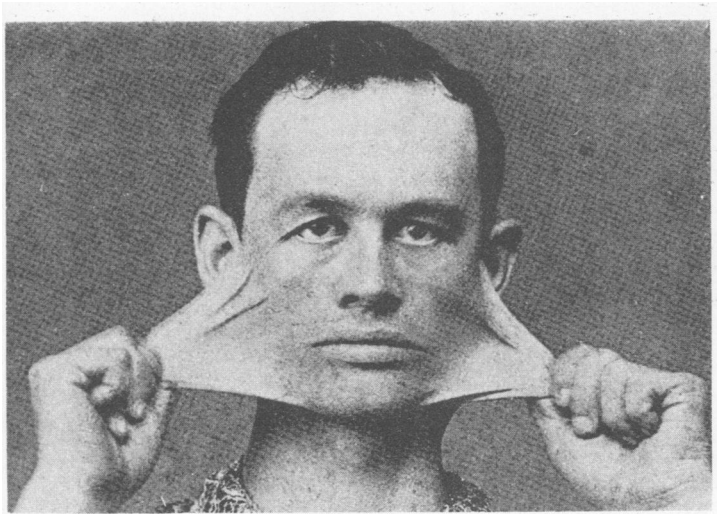

Figure 6.—Elastic Skin Man. (Courtesy of Circus World Museum, Baraboo, Wisconsin.)

Figure 7.—The Siamese Twins, Eng and Chang, with wives and two of their 21 offspring. (Courtesy of Circus World Museum, Baraboo, Wisconsin.)

ported his right foot and was carried by his brother. Three years later, Chang died during sleep and Eng awoke to discover that he was now attached to a cadaver. He immediately began to complain of severe cramping pain in all extremities and became diaphoretic and dyspneic. Within two hours he also died.

The family agreed to a limited postmortem examination, which was done by William H. Pancoast, professor of surgical anatomy at Jefferson Medical College in Philadelphia.[20] It was found that the twins had joined livers, thus confirming that any attempt to separate them during life would have been fatal. Although examination of the brains was forbidden by the family, it was postulated that Chang's cause of death was an intracerebral hemorrhage, and that Eng probably died from syncope caused by fear. The latter speculation was based on rather flimsy evidence: Eng's bladder was distended and his right testicle retracted. A postmortem cast of the Siamese Twins, as well as their joined livers removed at autopsy, are on display at the Mutter Museum in Philadelphia.

Unlike the Siamese Twins, who were under P. T. Barnum's control only briefly, William "Zip" Jackson was exhibited by Barnum for the greater part of his 67 years on the stage (1859 to 1926).[9] Zip, considered to be the "dean of freaks," was the most popular "pinhead." He was christened "Zip the What's It" after the Prince of Wales, while viewing him at the American Museum in 1860, exclaimed in astonishment "What is it?" Zip's failure to talk was attributed to Barnum's admonishment about jeopardizing the hoax that he was a new species, captured by explorers on the River Gambia "in a Perfectly Nude State, roving among the trees . . . ." In reality, Zip was a poor American black man with microcephaly and mental retardation.

Perhaps the most famous patient with a neurologic disease was John Merrick, known as the Elephant Man. His story was brilliantly and touchingly recorded in *The Elephant Man and Other Reminiscences* by Frederick Treves,[21] Surgeon-Extraordinary to Queen Victoria. Treves, known for his *Surgical Applied Anatomy* (1883)—which remained the authoritative text on the subject for many decades—was also a brilliant surgeon and teacher and a gifted man of letters.[22] He described his first encounter with the Elephant Man on exhibit at a vacant green grocer's shop in London in 1884:

> The showman pulled back the curtain and revealed a bent figure crouching on a stool and covered by a brown blanket. In front of it, on a tripod, was a large brick heated by a Bunsen burner. Over this the creature was huddled to warm itself. It never moved when the curtain was drawn back. Locked up in an empty shop and lit by the faint blue light of the gas jet, this hunched-up figure was the embodiment of loneliness. It might have been a captive in a cavern or a wizard watching for unholy manifestations in the ghostly flame. Outside the sun was shining and one could hear the footsteps of the passers-by, a tune whistled by a boy and the companionable hum of traffic in the road.

Treves, a lecturer on anatomy at London Hospital Medical College, arranged to examine Merrick at the college. Merrick's body was so deformed that he could not appear in public places unless completely hidden by a disguise consisting of a gigantic cap and long black cloak (Figure 8). Treves noted that his deformity

Figure 8.—John Merrick, on admission to London Hospital (from the *British Medical Journal*, Vol. 2, 1886).

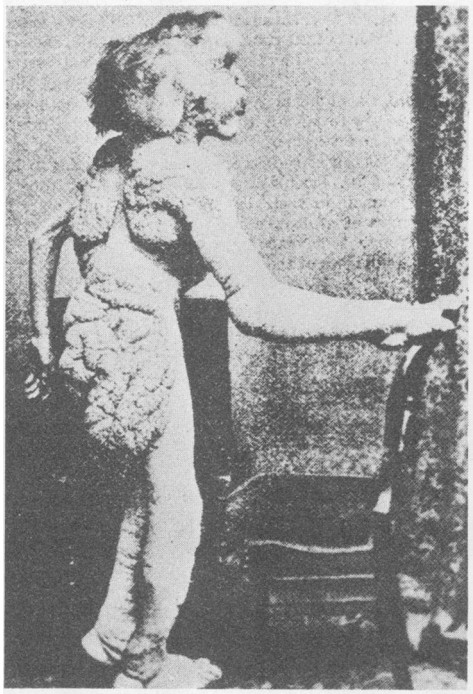

Figure 9.—John Merrick. Shortly before death at London Hospital (from the *British Medical Journal*[26]).

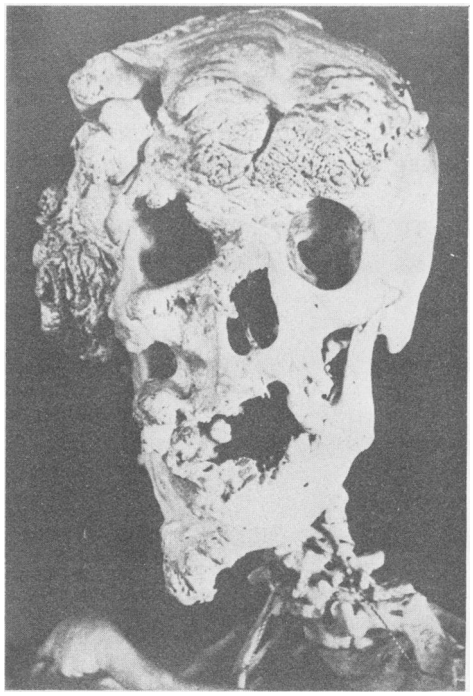

Figure 10.—John Merrick's Skull. (Reproduced with permission of E. P. Dutton, Inc., from Montagu.[22])

concerned the cutaneous and osseous systems and described the increased subcutaneous tissue, multiple "papillomatous growths," and the extensive "bony exostoses" and hypertrophy of limbs.[23] However, it is not surprising that Treves did not recognize this disorder that had been delineated only two years earlier by Frederich von Recklinghausen in his classic monograph on multiple neurofibromatosis.[24] From Treves' description and available photographs, Merrick apparently had extensive plexiform neuromas with the associated overgrowth of surrounding skin and subcutaneous tissue (elephantiasis neuromatosa), cutaneous pedunculated fibromas, hyperostosis, pronounced kyphoscoliosis and elephantic hypertrophy of the extremities. Hip disease was attributed to tuberculosis but more likely represented an associated cystic bony lesion (osteitis fibrosa cystica), sometimes resulting from an intraosseous neurofibroma.[25] His "bronchitis" may have been cystic lung disease reported to be associated with neurofibromatosis. The surgeon related that there was no suggestion of the disease in any of Merrick's relatives, though it is doubtful if he would have recognized the disorder (certainly not a formes frustes). The Elephant Man was extremely intelligent. This latter fact perhaps rendered his life most tragic of all.

After the examination, Merrick was returned to the itinerant showman and his journey continued. In the ensuing two years, the police frequently closed the exhibit to protect the public decency and Merrick eventually found himself no longer of any value. Thus he was turned loose in Belgium after his manager robbed him of his savings. He found his way back to Dr Treves at London Hospital with difficulty because his grotesque appearance caused him to be chased by crowds whenever he appeared in public. Treves arranged to have him admitted to London Hospital, writing "I had been guilty of an irregularity for the hospital was neither a refuge nor a home for incurables. Chronic cases were not accepted, but only those requiring active treatment." At last Merrick had found a home, almost as secure as the blind asylum of which he fantasized.

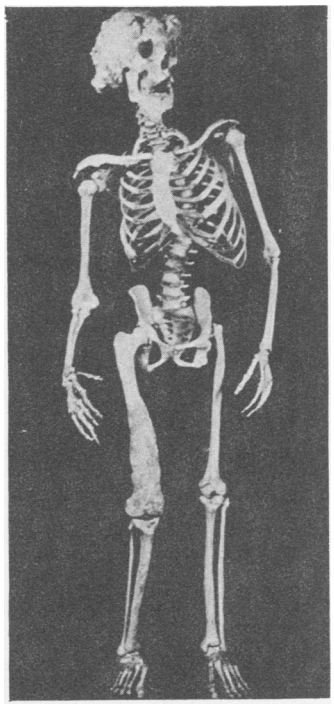

Figure 11.—John Merrick's Skeleton. (Reproduced with permission of E. P. Dutton, Inc., from Montagu.[22])

In his sanctuary at London Hospital for the next four years, Merrick was transformed into a gentleman under Dr Treves' tutelage. The Elephant Man became famous, receiving visits from the Princess of Wales and other royalty. He became an avid reader, accumulating a large library, and on occasion attended the Drury Lane Theater, after special arrangements were made to secure him a private secluded box. He related that he was "happy every hour of the day." Treves learned that his favorite patient had been given up by his mother as a small child due, no doubt, to his hideous deformity, and at an early age fell into the hands of unscrupulous showmen:

> Here was a man in the heyday of youth who was so vilely deformed that everyone he met confronted him with a look of horror and disgust. He was taken about the country to be exhibited as a monstrosity and an object of loathing. He was shunned like a leper, housed like a wild beast, and got his only view of the world from a peephole in a showman's cart.

Concerning the development of character, Treves notes that despite such a life of degradation and brutality:

> He had passed through fire and had come out unscathed. His troubles ennobled him. He showed himself to be a gentle, affectionate and lovable creature, as amiable as a happy woman, free from any trace of cynicism or resentment, without a grievance and without an unkind word for anyone.

In April 1890 John Merrick was found dead in bed. His head had become so massive that he had to sleep in a sitting position and when he attempted to sleep "like other people" he experienced respiratory compromise (see Figures 9, 10 and 11). At the inquest held at London Hospital, it was concluded that the cause of death was asphyxia with the weight of head compressing the trachea.[26] However, it was noted that he was found lying on his back and there was no disturbance of his bed coverings, thus he may have suffered an atlantoaxial dislocation with sudden spinal cord compression.[22] Treves concludes,

> As a specimen of humanity, Merrick was ignoble and repulsive; but the spirt of Merrick, if it could be seen in the form of the living, would assume the figure of an upstanding and heroic man, smooth browed and clean of limb, and with eyes that flashed undaunted courage.
>
> His tortured journey had come to an end. All the way he, like another, had borne on his back a burden almost too grievous to bear. He had been plunged into the Slough of Despond, but with manly steps had gained the farther shore. He had been made a "spectacle to all men" in the heartless streets of Vanity Fair. He had been ill-treated and reviled and bespattered with the mud of Disdain. He had escaped the clutches of the Giant Despair, and at last had reached the "Place of Deliverance," where his burden loosed from off his shoulders and fell from off his back, so that he saw it no more.

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